Author version

Published article.

Citation:

Guiné RPF (2019) Study of Consumer Acceptance by Means of Questionnaire SurveyTowards Newly Developed Yogurts with Functional Ingredients. Current Nutrition and Food Sciene, 15(3), 243-256.

STUDY OF CONSUMER ACCEPTANCE BY MEANS OF QUESTIONNAIRE SURVEY TOWARDS NEWLY DEVELOPED YOGURTS WITH FUNCTIONAL INGREDIENTS

Raquel P. F. Guiné

CI&DETS Research Centre and Department of Food Industry, Polytechnic Institute of Viseu, Portugal.

CITAB, University of Trás-os-Montes, Vila Real, Portugal.

*Corresponding author:
Raquel P. F. Guiné
Escola Superior Agrária de Viseu, Quinta da Alagoa, Estrada de Nelas, Ranhados, 3500-606 Viseu, Portugal.
Tel: + 351 232 446 640; Fax: +351 232 426 536
E-mail: raquelguine@esav.ipv.pt

Abstract

BACKGROUND: Today's consumers are becoming very much aware of the benefits of allying the concepts of pleasant food with health promoting properties. Hence the market for healthier foods, functional foods or even nutraceuticals has risen in the past decades.

OBJECTIVE: This work was designed to assess the consumers' possible acceptance of newly developed yogurts with functional ingredients, not yet marketed.

METHODS: A descriptive cross-sectional study was undertaken on a non-probabilistic sample of 347 participants. The data were collected from October to December 2015 in the Central Region of Portugal. The questionnaires were applied by direct interview after verbal informed consent only to participants aged 18 or over.

RESULTS: The results obtained showed that more than 90% of the participants liked yogurts and consumed yogurts regularly (~73%), either in the solid or liquid forms. The participants consumed functional yogurts, specifically for regulation of intestinal transit (~46%) and for weight control (~44%). When asked about the new yogurts with functional and detox properties, the participants indicated that they might be potential consumers of yogurts with the ability to eliminate toxins from the body (~69%). In spite of recognizing the importance of adding ingredients with certain functionalities, like parsley, watercress or celery, the consumers manifested some doubts that those ingredients might combine well in yogurts.

CONCLUSION: This work showed that selling yogurts with detox properties might be a good strategy because there might be a market for that type of product. However, without trying the samples and verifying the real taste of the products, the possible consumers have some doubts about the incorporation of certain ingredients, even though recognizing their roles as important.

Keywords: Functional yogurt, health effect, new product development, market study, consumer acceptance, survey.

1. INTRODUCTION

Dairy products provide nutrients and bioactive substances that contribute for the health improvement. Besides energy, they supply proteins, carbohydrates, liposoluble vitamins and B complex vitamins, as well as minerals such as calcium, phosphorus, magnesium, zinc, iodine or potassium [1,2]. A wide variety of studies have revealed that dairy products bring a positive impact for many pathologies like obesity, hypertension, type 2 diabetes, cardiovascular diseases, metabolic syndrome and cancer. Furthermore, the consumption of dairy foods enhances bone health [2–8]. In addition to that, yogurts constitute a privileged vehicle for administration of live microorganisms known as probiotics, which have demonstrated positive health benefits for the host [9].

In the last decades consumers have increased considerably their demand for health-enhancing food products and functional foods, such as low-fat, low-sugar, high-antioxidant or high-fibre. Their increased consciousness that food may decisively contribute for preventing and fighting disease allied to a longer life expectancy and a desire for a better quality of life have all contributed for this demand. Improve the understanding on consumers' preferences towards health-enhancing dairy products may benefit both the industry and customers [10,11].

Food products newly launched on the market may or may not succeed in their implementation on the competitive existing market. Promotional communications aimed at encouraging impulse purchases, appeal to pleasures of consumption, attractive packaging and the placement of products in the shelves all contribute to promote sales increase [12–14]. The role of marketing and advertising of unhealthy foods has contributed to the increase of inadequate eating practices and diets, which in turn have given place to a raise in health problems like obesity, diabetes or cardiovascular diseases. Hence, it becomes important to use the vehicles of communication to reverse the message transmitted and make changes towards providing opportunities to improve access to healthy foods, and increase the desire and will to purchase foods that contribute for an improved global health status [14,15]. However, before selling a new food product it is important that it is tested and has potential for commercialization. Consumer surveys and market studies are key factors for the success of these newly developed products, and allow to foresee the positive and less positive aspects valued by the potential future buyers, in time of corrections, if that would be the case [16]. There is a high rate of failure in new food product development but most time it is not well known the reasons for that, because the focus tends to be on the successful cases [17,18]. Crucial decisions and appropriate choices must unequivocally rely on consumer's trends and behaviour.

The aim of the present work was to investigate the consumer's attitudes towards new yogurts with functional ingredients, prior to their commercialization. The developed yogurts would have health benefits owing to the incorporation of different ingredients with diverse biologic effects, and the consumers would express their possible degree of approval and buying intentions by answering a questionnaire.

2. MATERIALS AND METHODS

2.1. Presentation of the products

The developed yogurts intended for commercialization included four variations, associated with the four seasons of the year according to the ingredients used and/or the health benefits provided, and whose properties are shown in Table 1.

Table 1. Ingredients and functionalities of the yogurts object for the market study.

Ingredients	**Main functionalities**
Variation: Winter	
Ginger	Anti-inflammatory / Thermogenic
Apple	Antioxidant / Rich in vitamins and minerals
Chia seeds	Improve intestinal transit / Appetite reducer
Cinnamon	Thermogenic / Reduces insulin resistance
Variation: Spring	
Pineapple	Helps in digestion / Weight control
Celery	Antioxidant / Diuretic
Mint	Antioxidant / Rich in vitamins and minerals
Variation: Summer	
Orange	Antioxidant / Improves cardiovascular health
Passion fruit	Antioxidant / Prevents neurodegenerative diseases
Parsley	Diuretic / helps in bone health
Carrot	Antioxidant / Anti-cancer effect
Flaxseed	Improves cardiovascular health / Control blood glucose
Variation: Autumn	
Pear	Anti-inflammatory / Antioxidant
Ginger	Anti-inflammatory / Thermogenic
Watercress	Diuretic and depurative / Anti-cancer activity

2.2. Instrument

The questionnaire was prepared to undertake a market study aimed at knowing the potential for commercialization of the products and consumer acceptance. The questionnaire included different parts destined to collect information about several important issues: Part I – Sociodemographic data; Part II – Anthropometric data and behavioural aspects; Part III – Satisfaction with body weight; Part IV – Eating habits related to yogurt; Part V – Acceptance of the new product; Part VI – Attitudes towards new ingredients for yogurt.

2.3. Data collection

A descriptive cross-sectional study was undertaken on a non-probabilistic sample of 347 participants. The data were collected from October to December 2015 in the Central Region of Portugal. The questionnaires were applied by direct interview after verbal informed consent only to adults (aged 18 or over). All ethical issues were verified when formulating and applying the questionnaire.

2.4. Statistical Analysis

For the analysis of the data, several basic descriptive statistical tools were used. Also the crosstabs and the chi square test were used to assess the relations between some of the categorical variables under study.

The level of significance considered was 5% at all cases. Cramer's V was used in some cases to evaluate the strength of the significant relations found between some of the variables at study. This coefficient varies between 0 and 1, and for $V \approx 0.1$ the association is considered weak, for $V \approx 0.3$ the association is moderate and for $V \approx 0.5$ or over, the association is strong [19].

For all data analyses the SPSS software, from IBM Inc. (version 24), was used.

3. RESULTS AND DISCUSSION

3.1. Sample characterization

In this survey participated 347 respondents aged a minimum of 18 years and maximum of 65 years, being on average 34 ± 12 years. The age was very similar for women and men, with mean values of 34 ± 13 years for women and 33 ± 12 years for men. The respondents were classified according to their age into young adults ($18 \leq \text{age} \leq 30$), which accounted for 47.0%, average adults

(31 ≤ age ≤ 50), corresponding to 42.1%, and finally senior adults (51 ≤ age ≤ 65), accounting for 10.9% of the sample.

As for gender, 59.7 % were female against a smaller proportion of men (40.3%). Concerning the level of education, only a few had the lowest level of education, 3.5 % for primary school, while the majority had completed secondary school (59.5%), and an important part had achieved the highest level (university degree, corresponding to 37.0%).

Regarding the civil state, 49.0% of the participants were single, 42.9% were married or lived together as marital couple, 7.0% were legally divorced or separated and 1.2% were widow.

3.2. Anthropometric and behavioural aspects

Because anthropometric data and some behavioural aspects are intimately related to people's food choices and sometimes condition their buying intentions, these aspects were also addressed in the questionnaire. Height and weight were obtained by self-response, allowing then to calculate the body mass index (BMI). Also questions about intensity of physical activity or opinions about their own diet were included.

The height was on average 1.67 ± 0.10 m, varying from a minimum of 1.40 m to a maximum of 2.01 m. The women presented a lower mean height, 1.62 ± 0.07 m, and varying from 1.40 m to 1.89 m, while for men the mean height was higher, 1.75 ± 0.07 m, varying from 1.55 to 2.01 m.

For weight, the global sample presented a mean value of 67.93 ± 13.10 kg, corresponding to a minimum of 42.0 kg and a maximum of 146.0 kg. As expected, the average weight was lower for women (62.54 ± 11.97 kg), when compared to men (75.97 ± 10.31 kg), with intervals of [42.0;146.0] and [52.0;106.0], respectively for women and men.

The values of BMI were calculated for each participant from the self- reported values for height and weight, according to the following formula.

$$BMI = \frac{Weight\ (kg)}{[Height\ (m)]^2} \quad (1)$$

According to the values of the BMI, the standards classification was followed: underweight (BMI < 18.5 kg/m^2), healthy weight (18.5 ≤ BMI < 25 kg/m^2), overweight (25 ≤ BMI < 30 kg/m^2), obese (BMI ≥ 30 kg/m^2) [20,21].

For the sample at study, the majority had a healthy weight (62.8%), but still an important part had some excessive weight (29.7% overweight). The more extreme cases, underweight and obesity had a small incidence, with 1.5% and 6.1%, respectively. The observed trends were similar for both genders: for women (underweight – 1.9%, healthy weight – 69.4%, overweight – 22.3%, obese –

6.3%) as well as for men (underweight – 0.7%, healthy weight – 52.9%, overweight – 40.6%, obese – 5.8%).

When asked about the frequency of practicing physical activity, an important part admitted never to do it (24.2%), which is preoccupying given the importance of physical activity as preventive factor for many diseases [22]. In fact the absence of physical activity is among the important risk factors for morbidity and mortality [23]. From the respondents, the majority practiced physical activity occasionally (once/week) (45.8%), which is also considered inappropriate. With moderate physical activity (2-3 times/week) were 21.6% and intense (more than 3 times/week) 8.4%.

Some slight variations were observed for women and men regarding the intensity of physical activity. While for women about half of the participants do it occasionally (never – 23.7%, occasionally – 50.2%, moderately – 19.8%, intense – 6.3%), for men there seems to be a slight trend to increase intensity of physical activity (never – 25.0%, occasionally – 39.3%, moderately – 24.3%, intense – 11.4%). Nevertheless, when the variables Physical Activity *versus* Gender were tested by the Chi square test, appropriate for categorical variables, (χ^2= 5.673; p = 0.129), no significant differences were found, meaning that these variables were not correlated, i.e., gender did not influence the level of physical activity.

It has been demonstrated that physical activity habits are determined throughout life, and conditioned by several factors, including socioeconomic and cultural determinants as well as environmental and social burdens [24].

To assess the relation between Physical Activity *versus* Civil State, also the Chi square test was used (χ^2= 18.374; p = 0.031) but in this case significant differences were encountered and therefore an association was demonstrated between Civil State and Physical Activity, so that the single people tend to practice more exercise.

Also the level of education has proven to influence physical activity (Chi square test: χ^2= 26.112; p = 0.037) and people with higher education levels tend to devote themselves more to exercise. According to Umberson and Montez [25], cultural resources like comprehension, attitudes and behaviour, influence health status and encourage attitudes towards a physically active life style [26].

As people grow older, they star having more difficulties with their body and diminish the intensity of exercise. Sedentary behaviour has revealed a more important problem at old age than earlier in life [22,25]. In this work, the association between Physical Activity *versus* Age Group was assessed by the Chi square test (χ^2= 24.006; p = 0.001), whore results confirmed that these two

variables were correlated, i.e., age influenced the intensity of physical activity so that the older tend to practice less physical exercise.

Another of the behavioural aspects investigated was if the participants considered practicing a balanced diet. The results indicated that 1.7% admitted that they never did it, 8.1% did it rarely, 49.5% did it sometimes, 30.3% did it many times 30.3% and 10.4% responded that they always practiced a balanced diet. The results for both genders were slightly different, women (never – 1.5%, rarely – 4.9%, sometimes – 48.5%, many times 33.0%, always – 12.1%) and men (never – 2.1%, rarely – 12.9%, sometimes – 50.7%, many times 26.4%, always – 7.9%). The relation between these variables was investigated by the Chi square test for Balanced Diet *versus* Gender (χ^2= 9.559; p = 0.049). The results indicated significant differences and hence these variables were correlated and gender influences the practice of a balanced diet. It was observed that women tend to devote more care into practicing a healthy diet. It is important to notice that the concept of balanced or healthy diet is ambiguous and it is difficult to determine the impact of specific dietary components in disease prevention and/or onset, because complex diets contain a variety of nutrients as well as beneficial and harmful components [27].

The associations between Balanced Diet *versus* Civil State and between Balanced Diet *versus* Education Level were also investigated and the results revealed that neither of these variables, Civil State (Chi square test: χ^2= 10.920; p = 0.536) or Education Level (Chi square test: χ^2= 24.749; p = 0.412) influenced the eating habits related to a healthy diet.

3.3. Satisfaction with body weight

Dissatisfaction with body image constitutes a risk factor for developing some eating pathologies, including obesity, binge eating, anorexia or bulimia nervosa [28,29]. Besides, it has been seen as a frequent cause for conditioning food intake, namely in terms of restriction. Melnyk et al. [30] have reported that body image satisfaction is particularly variable depending on the context, principally in the case of people who worry about weight and shape. Research has widely revealed associations between BMI and body image satisfaction [29,31,32].

The participants in the present study were not very satisfied with their own body image, since 57.8% responded they were not satisfied against only 42.2% who were satisfied. Not surprisingly, the percentage of women who were not satisfied with their body weight was higher (48.3%) when compared to men (33.1%).

The association between Satisfaction With Body Weight *versus* BMI Class was investigated and the results of the Chi square test (χ^2= 40.826; p = 0.000) revealed that these variables were in fact

correlated because statistically significant differences were found, and therefore this study confirmed that BMI Class influenced Satisfaction With Body Weight. Furthermore, according to the value of Cramer's V (0.345) the association was found moderate, and the trend showed that only people that had a healthy weight were pleased with their body weight and people with excessive weight or even those with low weight were not satisfied with it.

Also the variables Satisfaction With Body Weight *versus* Gender were tested (Chi square test: χ^2= 7.893; p = 0.005) and the results showed that again the variables were correlated, i.e., gender influenced Satisfaction With Body Weight, so that men tended to be more satisfied with their body weight. Nevertheless, the coefficient of association was weak (Cramer's V = 0.151).

Another association was investigated between Satisfaction With Body Weight *versus* Age Group (Chi square test: χ^2= 3.236; p = 0.198), but in this case no significant association was found between the variables at study, and therefore, age did not influence the degree of satisfaction with the body weight of the participants.

Figure 1 shows the possible reasons identified as responsible for the dissatisfaction with body weight. The majority (46%) considered that they had normal weight, but still would like to lose some weight (between 2 and 5 kg). This reveals that people tend to perhaps follow too strict stereotypes, as a result of the dissemination and/or misinterpretation of the concepts of "what is a perfect body" or "what is an ideal shape". Body image is a complex concept and a multidimensional construct, and is associated with individuals' attitudes and self-perceptions of their bodies [33,34]. On the other hand, 36% admitted that they had excessive weight, which is interesting considering that from the sample at study about 30% indeed had BMI corresponding to excessive weight.

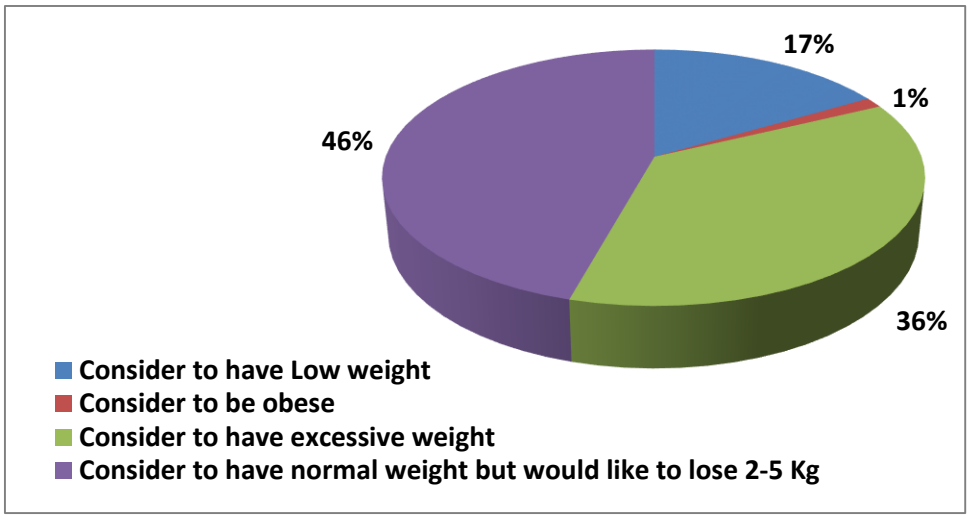

Figure 1. Reasons pointed by the participants for their dissatisfaction with body weight.

The association of the variables Reasons for Dissatisfaction With Body Weight *versus* Gender was investigated, and the results of the Chi square test (χ^2= 2.921; p = 0.404) indicated that the variables were not correlated after all, i.e., gender did not influence the satisfaction with body weight.

For those who were not satisfied with their body weight what could be the reasons for having excess or absence of weight? This was also one of the questions of the study and the results obtained are shown in Figure 2. On top of the list came the inadequate food habits, indicated by 52% of the men and by 36% of the women. Close by, in second place, came sedentarism, for 33% of men and 29% of women. These are in fact two of the major key factors influencing the maintenance of a healthy body weight. Sedentary behaviour has been identified as a risk factor for several health outcomes: increased risk of type 2 diabetes, cardiovascular diseases, cancer, depression and higher risk of premature mortality [35–40]. Overweight and obesity can adversely affect the health and much research evidenced that increased rates excessive weight and obesity constitute a main risk factor for non-communicable disorders such as heart disease, hypertension, type 2 diabetes mellitus, and some types of cancer [41,42].

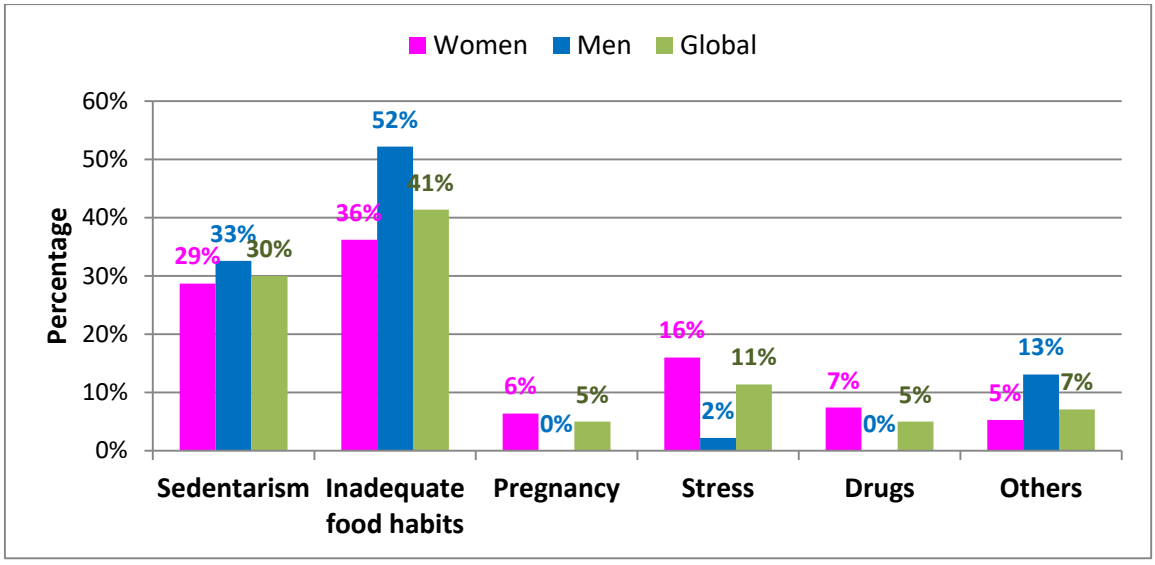

Figure 2. Reasons for having excess or absence of weight indicated by those who were not satisfied with their body weight.

The association between the variables Reasons for Inappropriate Weight *versus* Gender (Chi square test: χ^2= 13.051; p = 0.023) was found significant, and therefore Gender influenced the perceptions of the participants about the reasons that could justify their inappropriate body weight.

It was also investigated the association between the Reasons for Inappropriate Weight *versus* Physical Activity (Chi square test: χ^2= 44.273; p = 0.000) and a statistically significant association was found, meaning that exercise influenced perceived reasons for inappropriate body weight. Sedentarism was indicated as the most important reason by those who never practiced physical activity and the second more important reason was inadequate food habits, indicated by those who practice physical activity only occasionally.

From the sample at study, 63.0% admitted that they tried to loose or gain weight and only 37.0% never tried to change their body weight. However, the prevalence of attempts to change body weight were different between genders, since 70.9% of the women tried to change body weight and only 51.1% of the mean tried it. The Chi square test (χ^2= 13.169; p = 0.000) confirmed a significant association between these variables, and hence it was found that gender influenced the behaviours towards trying to loose or gain weight. This association was weak to moderate (Cramer's V = 0.200).

Regarding the influence of Physical Activity into Attempts to Change Weight, the results of the Chi square test (χ^2= 1.453; p = 0.693) indicated that these variables were not correlated.

Table 2 shows the methods that were used by the participants to change their body weight. Diet and exercise were indicated as the most frequently used methods, which is in accordance with the fact that these are key factors for controlling body weight, as previously noticed.

Table 2. What alternatives were used by the participants to attempt loose or gain weight.

Alternatives	Women		Men		Global	
	Yes (%)	No (%)	Yes (%)	No (%)	Yes (%)	No (%)
Diet	62.6	37.4	46.3	53.7	57.3	42.7
Exercise	57.2	42.8	68.7	31.3	61.0	39.0
Drugs	10.2	89.8	3.0	97.0	7.8	92.2
Food supplements	10.9	89.1	13.6	86.4	11.8	88.2
Others	5.8	94.2	1.5	98.5	4.4	95.6

3.4. Consumption habits about yogurts

Because the ultimate objective of this survey was related to the commercialization of some specific yogurts, the habits of the participants regarding the consumption of yogurts in general were investigated. The results showed that 92.4% like yogurts, being this percentage slightly higher for women (95.1%) when compared to men (88.1%). It was further verified that there was a significant association between these variables (Chi square test: χ^2= 5.605; p = 0.018), indicating that gender influenced the liking for yogurt. However, the association between Like Yogurt *versus* Age Group,

was not significant (Chi square test: χ^2= 0.723; p = 0.697), and therefore these variables were not correlated.

From the participants questioned, 73.1% consumed yogurts regularly, with the percentage for women being a little higher than for men (75.5 and 69.4%, respectively). However, no significant association was found between Regular Consumption of Yogurts *versus* Gender (Chi square test: χ^2= 1.523; p = 0.217). Similar results were obtained for the influence of variables such as Age Group (Chi square test: χ^2= 0.927; p = 0.629), Education (Chi square test: χ^2= 3.791; p = 0.580) or Physical Activity (Chi square test: χ^2= 3.902; p = 0.272), i.e., none of these variables influenced the Regular Consumption of Yogurts.

The frequency of consumption of yogurts is presented in Figure 3, and almost half of the participants consume yogurts daily, being the percentages very similar for men and women. In second came the option of consuming 2/3 times per week, also with an important expression and those who consumed yogurt once a week or less represented a minority. These results indicate that yogurt is a basic food in the daily diet of most people and therefore this is important for the introduction in the market of new products in this line of dairy products.

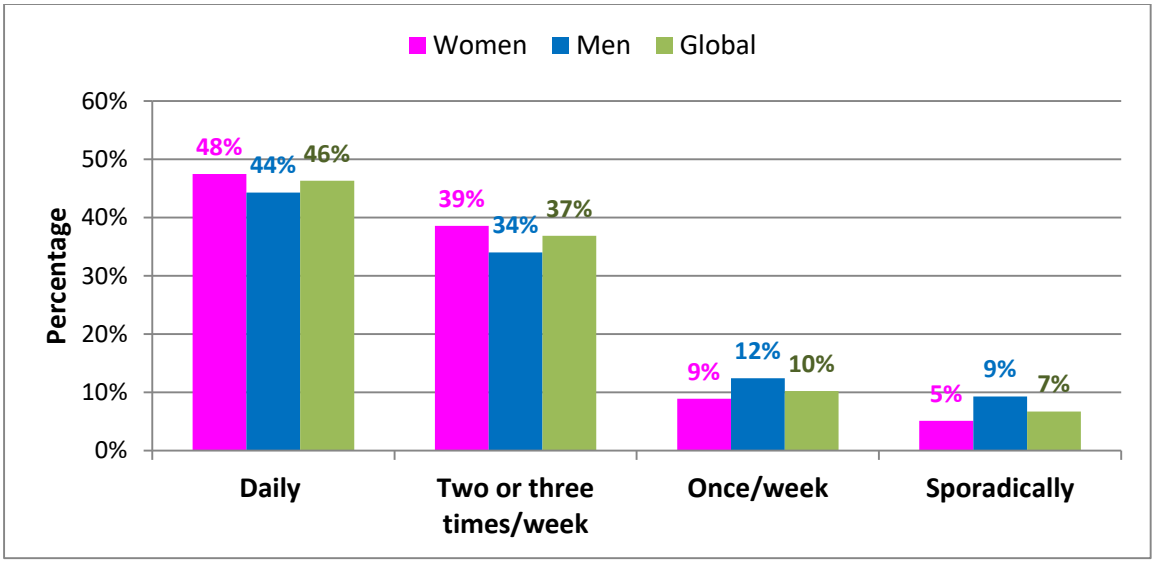

Figure 3. Frequency of consumption of yogurts.

As to the possible associations between the variables Frequency of Consumption *versus* Gender and *versus* Age Group, it was found that there were no significant associations, and therefore neither gender (Chi square test: χ^2= 2.799; p = 0.424) nor age (Chi square test: χ^2= 2.723; p = 0.843) influenced the frequency of consumption of yogurts.

Figure 4 shows the preference regarding the consistency of the yogurts, and the results showed either liquid or solid yogurts were appreciated by 52% of the participants, being these two forms of yogurts appreciated slightly more by women when compared to men (57% and 44%, respectively). However, these differences between gender were not statistically significant, as the results of the Chi square test (χ^2= 4.859; p = 0.088) indicated.

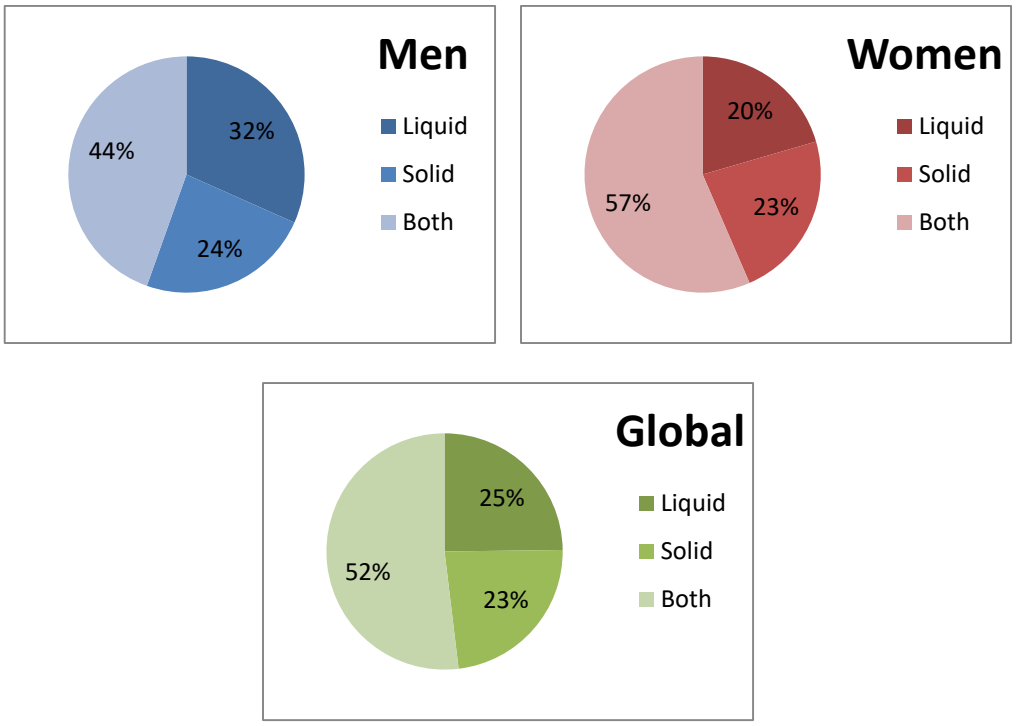

Figure 4. Preference for consistency of yogurt, according to gender.

Table 3 presents the types of yogurts consumed by the participants in the survey. The yogurts with aroma were the most consumed (61.3%), either by women (65.2%) or by men (55.0%). Following in importance appeared the yogurts with small pieces of fruit (38.2%) and those with fruit pulp (31.0%). The natural yogurts were consumed by 24.0% and those with separation of parts only by 8.8%.

Table 3. Types of yogurt consumed by the participants.

Type	Women		Men		Global	
	Yes (%)	No (%)	Yes (%)	No (%)	Yes (%)	No (%)
Natural	29.8	70.2	14.9	85.1	24.0	76.0
With small pieces of fruit	36.0	64.0	41.6	58.4	38.2	61.8
With aroma	65.2	34.8	55.0	45.0	61.3	38.7
With separation of parts	8.7	91.3	9.0	91.0	8.8	91.2

Creamy/with fruit pulp	33.5	66.5	27.0	73.0	31.0	69.0

From the participants in the survey, 46.9% usually consume functional yogurts, being these types of yogurt slightly more valued by women (51.9%) when compared to men (39.0%). The results of the Chi square test made to the association between the variables Consumption of Functional Yogurts *versus* Gender, showed that there was a significant association between these variables (χ^2= 4.096; p = 0.043), and hence, gender influenced the consumption of functional yogurts. Nevertheless, this association was weak, given the low value of Cramer's coefficient (V = 0.126).

Other possible associations were investigated, namely the influence of variables like age, education, physical activity or practice of a balanced diet on the habits of consumption of functional yogurts. The results revealed that in all cases no significant associations were found, and therefore neither of those variables influenced the consumption of functional yogurts: age (Chi square test: χ^2= 0.019; p = 0.990), education (Chi square test: χ^2= 6.717; p = 0.243), physical activity (Chi square test: χ^2= 2.784; p = 0.426) or balanced diet (Chi square test: χ^2= 6.708; p = 0.152).

Table 4 shows the types of functional yogurts consumed by the participants in this survey. The most consumed were those for improvement of intestinal transit (46.0%) followed by the light yogurts (44.4%) and in third came the yogurts that help lower blood cholesterol (25.2%). These trends were not much different between women and men, with the two top products being the yogurts for intestinal and weight control the most consumed, although not in the exact same order of priority, since women consume more the light yogurts when compared to men.

Table 4. Types of functional yogurts consumed by the participants.

Types of functional yogurts	Women		Men		Global	
	Yes (%)	No (%)	Yes (%)	No (%)	Yes (%)	No (%)
Regulate Cholesterol	24.1	75.9	27.5	72.5	25.2	74.8
Improve intestinal transit	44.2	55.8	50.0	50.0	46.0	54.0
Weight control (light)	51.2	48.8	30.0	70.0	44.4	55.6
Improve immune system	16.3	83.7	20.0	80.0	17.5	82.5
Enriched with calcium	12.8	87.2	25.0	75.0	16.7	83.3
Soy yogurts	5.9	94.1	2.5	97.5	4.8	95.2
Without lactose	8.2	91.8	2.5	97.5	6.4	93.6
Others	6.3	93.7	2.8	97.2	5.2	94.8

3.5. Acceptance of the new product

In recent years, ‘detox’ agents have been widely consumed either in the form of diets or nutritional supplements [43]. Among detox products marketed stand juices, diets and nutritional supplements, saunas, fasting, exercise, oral, rectal and intravenous chelating agents, among others [44]. When asked if they were familiar with the term detox, 61.5% of the participants replied positively while 38.5% said they were not familiar with the term. However, when women were compared to men, the results were quite different, since 69.7% of women were familiar with ther term against only 49.3% of the men. The results of the Chi square test for the association of the variables Familiarity with the concept DETOX *versus* Gender indicated significant differences (χ^2= 14.127; p = 0.000), meaning that these variables were correlated and gender influenced the knowledge about detox concept. Nevertheless, the association was weak (V = 0.205).

Also the association of the variables Familiarity with the concept DETOX *versus* Age Group was found significant (Chi square test: χ^2= 17.416; p = 0.000) indicating that also age influenced the knowledge about detox concept, and young adults are more familiar than other ages groups. Again the association was weak (V = 0.228).

Another variable that was found associated with the Familiarity with the concept DETOX was the level of education (Chi square test: χ^2= 23.754; p = 0.000), and people with university degree significantly more familiar with the concept. The value of Cramer’s coefficient (V = 0.267) indicated that the association was moderate.

Variables like Physical Activity (Chi square test: χ^2= 5.768; p = 0.123) or Practice of a Balanced Diet (Chi square test: χ^2= 9.232; p = 0.056) were not found significantly associated with Familiarity with the concept DETOX, and therefore neither of those influenced the knowledge of the participants about this term.

In general terms, a toxin is a poisonous substance produced by living cells or organisms, which, when in the human body in specific concentration manifests harmful effects, including cancer, reproductive disturbances, as well as other metabolic effects and even mental health problems [45]. The human body has the ability to continually undergo natural detoxification through various excretory functions, if the amount of toxins is not too excessive. However, the term ‘detox’ denotes the excretion of accumulated toxins in lipid deposits, beyond the natural detoxification [46].

Table 5 shows how the participants in the survey interpreted the meaning of the term detox, and a very significant percentage (76.8%) in fact were recognizant with the true meaning of detox, i.e., to eliminate toxins from the human body. However, some people still associated detox to loss of body weight (23.5%) or simply considered it a fashion dietary trend (22.5%).

Table 5. Self interpretation of the meaning of Detox.

	Women		Men		Global	
	Yes (%)	No (%)	Yes (%)	No (%)	Yes (%)	No (%)
Eliminates pesticides from peels of fruits/vegetables	3.7	96.3	5.6	94.4	4.4	95.6
Eliminates toxins from the human body	78.5	21.5	74.2	25.8	76.8	23.2
Loss of body weight	27.7	72.3	16.9	83.1	23.5	76.5
Fashion dietary trends	21.5	78.5	24.2	75.8	22.5	77.5

When asked if they consumed detox products, only 14.1% admitted they do against 85.9% who did not. Interestingly the results were similar for both genders (14.1% for women and 14.2% for men). The results of the Chi square test (χ^2 = 0.001; p = 0.978) confirmed that gender was not associated with the consumption of detox products, i.e., there were no significant differences between genders.

The associations between Consumption of detox products and the variables Age or Education were also investigated and the results revealed that neither of those variables was associated with the Consumption of detox products: Age (Chi square test: χ^2= 3.442; p = 0.179) or Education (Chi square test: χ^2= 6.672; p = 0.246).

The associations between Consumption of detox products and behavioural variables such as Physical Activity or Balanced Diet were also checked. The results showed that while physical activity was significantly associated with the consumption of detox products (Chi square test: χ^2= 13.359; p = 0.004, and therefore physical activity level influenced consumption of detox products (V = 0.200; weak association), the variable Balanced Diet was not (Chi square test: χ^2= 5.580; p = 0.233).

Another of the investigated possible associations was the Consumption of detox products *versus* Satisfaction with body weight, but the results showed that no such association was significant (Chi square test: χ^2= 0.730; p = 0.393).

Table 6 presents which detox products the participants consume and infusions came first on top of the list being consumed by 41.3% of the respondents. Also juices and shakes, with 34.0% and 30.6%, respectively, were identified as consumed by a significant part of the sample. Drugs and supplements had a little expression (8.7% and 13.0%, respectively).

Table 6. Types of Detox products consumed by the participants.

Type of detox products	Women		Men		Global	
	Yes (%)	No (%)	Yes (%)	No (%)	Yes (%)	No (%)

Shakes	21.4	78.6	57.1	42.9	30.6	69.4
Juices	29.6	70.4	40.0	60.0	34.0	66.0
Infusions	50.0	50.0	30.0	70.0	41.3	58.7
Drugs	15.4	84.6	0.0	100.0	8.7	91.3
Food supplements	15.4	84.6	10.0	90.0	13.0	87.0
Others	11.5	88.5	5.0	95.0	8.7	91.3

Detox yogurts are not yet marketed in Portugal, but the participants were asked if they would consume this type of yogurts, and 62.7% responded that they would. This high percentage of intentions to consume yogurts detox as compared to the consumption of other detox products may be explained by the fact that most people actually consume yogurts in their regular diets (over 70%), and therefore this association between a food that they consume regularly and the extra benefits of detoxification properties seems to be valued.

When seen by gender, the results are different, with women manifesting more interest in consuming detox yogurts (67.7%) as compared to men (55.2%). These differences between genders were statistically significant (Chi square test: χ^2= 5.317; p = 0.021), and the gender demonstrated to influence the intention of consuming yogurts detox, although the association was found weak (V = 0.126).

The variables Age Group or Education Level were found not significantly associated with the intention of consuming yogurts detox (Chi square tests: χ^2= 2.905; p = 0.234 and χ^2= 7.472; p = 0.188, respectively for age and education).

The association between Intention of consuming yogurts detox *versus* Physical Activity was not statistically significant (Chi square test: χ^2= 7.579; p = 0.056) and so physical activity level did not influence the predisposition to buy yogurts detox. Contrarily, the variable Balanced Diet was found significantly associated with buying intentions (Chi square test: χ^2= 12.081; p = 0.017), although the association was weak according to the low value of Cramer's V coefficient (V = 0.190).

Because some of the participants associated the idea of detox to losing body weight, as seen previously, the association between the Intention of consuming yogurts detox *versus* Satisfaction with body weight was also investigated. The results showed that those variables were correlated (Chi square test: χ^2= 4.594; p = 0.032), and Satisfaction with bodyweight influenced the Intention of consuming yogurts detox (V = 0.117; weak association). However, the association of the variables Intention of consuming yogurts detox *versus* Have tried to lose/gain weight was not significant (Chi square test: χ^2= 3.586; p = 0.058).

Table 7 presents the results concerning which attributes the participants would like to find in yogurts detox. The elimination of toxins comes first on the top of the list, with 68.9% of positive answers. However, other functionalities not directly linked to the true essence of the detox concept were also pointed out, like lose body fat (38.6%), regulate intestinal transit (35.2%), lose body weight (31.0%) or diuretic (25.7%).

Table 7. Attributes that the participants would like to find in Detox yogurts.

	Women		Men		Global	
	% Yes	% No	% Yes	% No	% Yes	% No
Eliminate toxins	67.4	32.6	71.6	28.4	68.9	31.1
Lose body weight	36.8	63.2	20.3	79.7	31.0	69.0
Lose body fat	43.4	56.6	29.7	74.3	38.6	61.4
Regulate intestinal transit	40.4	59.6	25.7	74.3	35.2	64.8
Diuretic	30.9	69.1	16.2	83.8	25.7	74.3
Others	2.3	97.7	2.7	97.3	2.4	97.6

Because the developed yogurts contained many ingredients, some more known and others perhaps very unconventional, it was also investigated how the potential future consumers faced each of those ingredients and their relations to the product in question.

Table 8 refers to the importance of each of the ingredients, considering their main functionalities. In general all ingredients were recognized as important (score 4) or very important (score 5), corresponding to the highest percentage of answers. Ingredients recognized by the majority as very important (with the maximum sore of 5 points) were pineapple, cinnamon, pear, orange, passion fruit, carrot and flaxseed; and these corresponded to percentages ranging from 36.5% to 50.5%. The ingredients mostly categorized as important (with 4 points) were all the others, with percentages varying from 28.5% to 37.2%.

Table 8. Recognized importance of the ingredients used based on their major functionalities.

Ingredient	**Main functionalities**	**Score[1]**				
		1	**2**	**3**	**4**	**5**
Pineapple	Helps in digestion / Weight control	1.5	3.0	15.2	29.8	**50.5**
Celery	Antioxidant / Diuretic	8.2	16.0	24.2	**33.5**	18.0
Mint	Antioxidant / Rich in vitamins and minerals	7.7	11.7	28.6	**31.6**	20.4
Apple	Antioxidant / Rich in vitamins and minerals	6.2	11.8	26.2	**28.7**	27.2
Chia	Improve intestinal transit / Appetite reducer	8.3	13.5	26.9	**28.5**	22.8
Cinnamon	Thermogenic / Reduces insulin resistance	3.6	6.7	17.4	34.9	**37.4**
Ginger	Anti-inflammatory / Thermogenic	4.6	9.2	21.9	**37.2**	27.0

Pear	Anti-inflammatory / Antioxidant	1.5	3.1	10.8	36.9	**47.7**
Watercress	Diuretic and depurative / Anti-cancer activity	10.2	9.6	27.4	**31.5**	21.3
Orange	Antioxidant / Improves cardiovascular health	2.6	3.6	12.8	33.8	**47.2**
Passion fruit	Antioxidant / Prevents neurodegenerative diseases	1.5	3.0	12.1	33.8	**49.5**
Parsley	Diuretic / helps in bone health	10.8	13.8	24.1	**29.7**	21.5
Carrot	Antioxidant / Anti-cancer effect	4.6	3.6	19.8	35.5	**36.5**
Flaxseed	Improves cardiovascular health / Control blood glucose	1.5	5.1	12.8	33.2	**47.4**

[1]scale: 1 = not important → 5 = very important

Figure 5 shows the opinion of the participants about the possible combination of the different ingredients with yogurt. The ingredients that were identified as possibly not linking very well with yogurts were parsley (77% negative answers), celery (76%) and watercress (75%), which are all green leaf vegetables/herbs, and have not been used in yogurts so far.

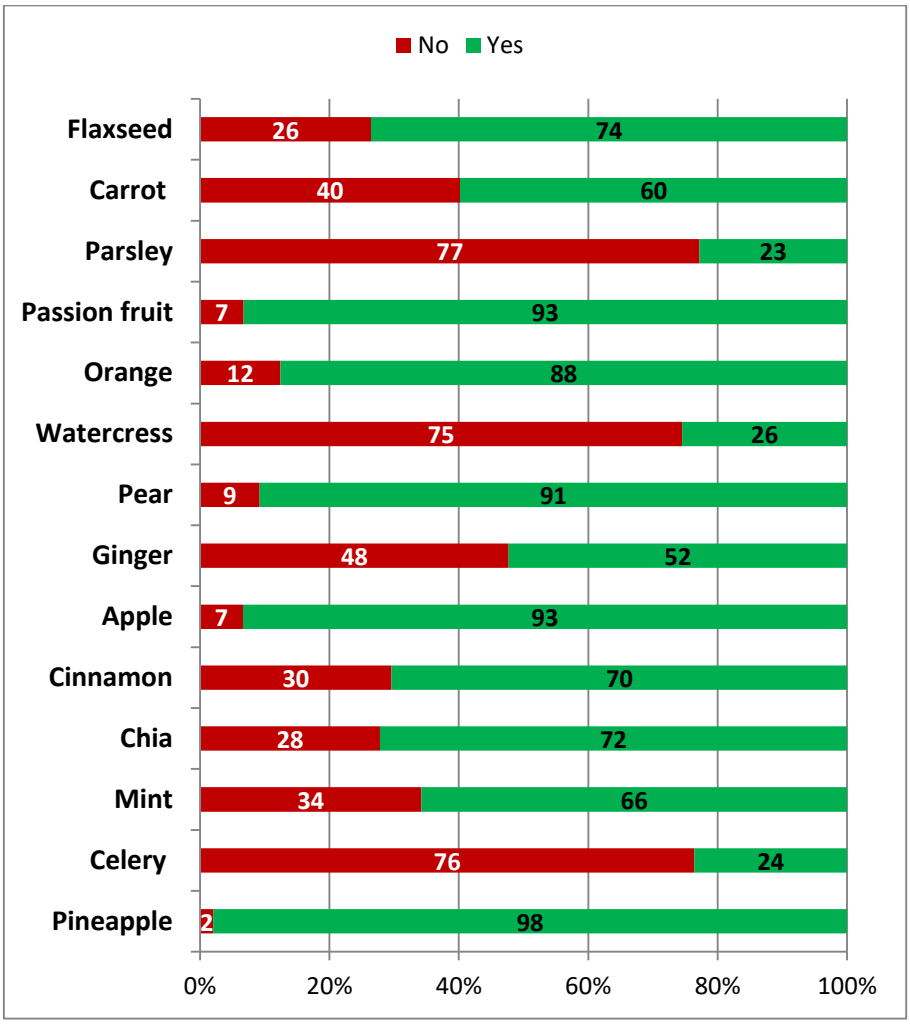

Figure 5. Opinion of the participants about the combination of the ingredients with yogurt.

Figure 6 shows the results about the opinion of the participants regarding the strangeness of incorporating the different ingredients into yogurt, and they confirmed the previously seen evidence that parsley, watercress and celery were not seen as natural ingredients to add into yogurts, with percentages of votes for "very strange" of 54%, 53% and 49%, respectively.

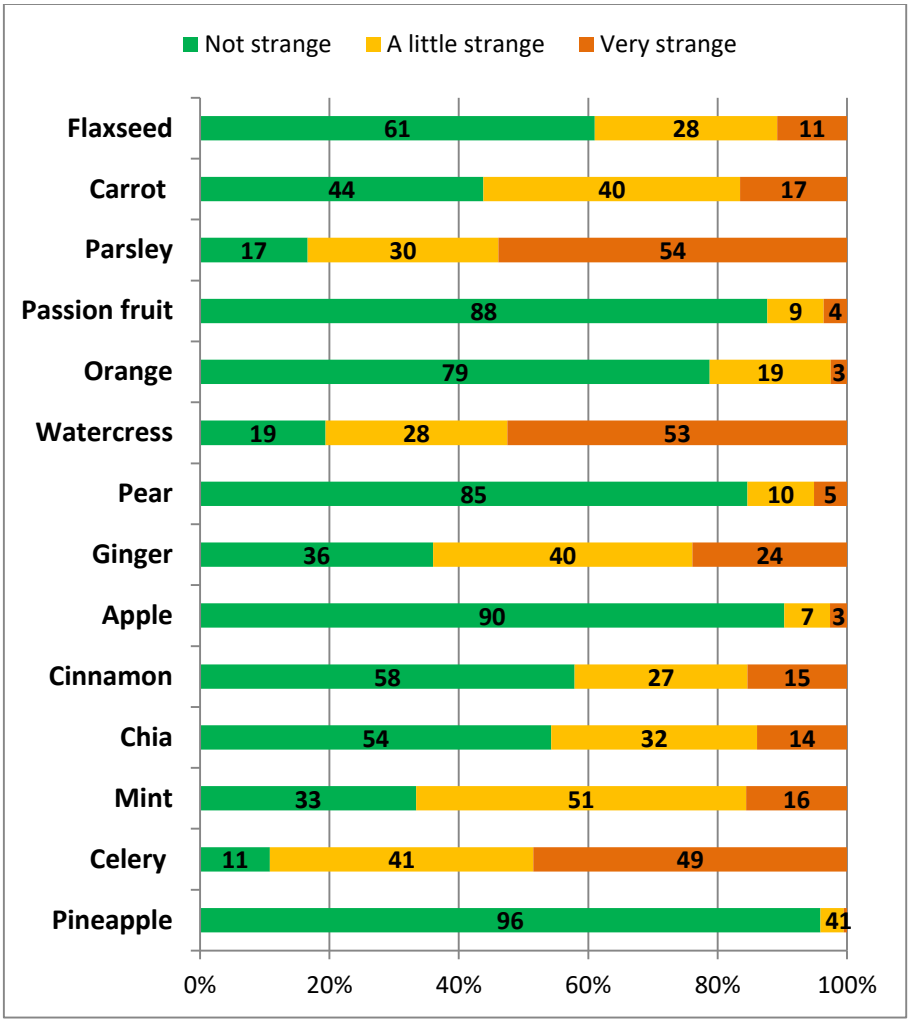

Figure 6. Opinion of the participants about strangeness of incorporating the ingredients into yogurt.

4. CONCLUSION

This work allowed obtaining interesting results about the sample of population at study, namely in terms of some behavioural aspects, the influence of satisfaction with body weight on their attitudes and consumption habits specifically about yogurts.

Among the most relevant results are highlighted the high percentage of people who liked yogurts (92.4%) and also who consumed yogurts regularly (73.1%), with about 50 % consuming yogurts on a daily basis. When it comes to the preference for solid or liquid yogurts, the majority of the participants showed no preference, consuming both types equally. The functional yogurts were

identified as products consumed by the participants, particular those for regulation of intestinal transit (46%) and for weight control – light (44.4%).

Regarding the possible acceptance of the new products developed, yogurts with functional ingredients and detox properties, the participants revealed that they would like to find on sale yogurts with the ability to eliminate toxins from the body (68.9%), among other functionalities: lose body fat (38.6%), regulate intestinal transit (35.2%), lose body weight (31.0%) or diuretic effect (25.7%).

Although recognizing the importance of adding ingredients with certain functionalities, like parsley, watercress and celery, still the consumers do not believe that these ingredients might combine well in yogurts.

5. ACKNOWLEDGMENTS

The author thanks Instituto Politécnico de Viseu/CI&DETS and FCT - Fundação para a Ciência e Tecnologia, I.P., for financial support under the project UID/Multi/04016/2016.

Thanks to the students from IDAPA (ESAV) for the data collection.

6. REFERENCES

[1] Dror DK, Allen LH. Dairy product intake in children and adolescents in developed countries: trends, nutritional contribution, and a review of association with health outcomes. Nutr Rev 2014;72:68–81. doi:10.1111/nure.12078.

[2] Rahnama H, Rajabpour S. Factors for consumer choice of dairy products in Iran. Appetite 2017;111:46–55. doi:10.1016/j.appet.2016.12.004.

[3] Barrea L, Di Somma C, Macchia PE, Falco A, Savanelli MC, Orio F, et al. Influence of nutrition on somatotropic axis: Milk consumption in adult individuals with moderate-severe obesity. Clinical Nutrition n.d. doi:10.1016/j.clnu.2015.12.007.

[4] Freitas M. Chapter 24 - The Benefits of Yogurt, Cultures, and Fermentation. In: Floch MH, Ringel Y, Walker WA, editors. The Microbiota in Gastrointestinal Pathophysiology, Boston: Academic Press; 2017, p. 209–23. doi:10.1016/B978-0-12-804024-9.00024-0.

[5] Gopinath B, Flood VM, Burlutsky G, Louie JCY, Baur LA, Mitchell P. Dairy food consumption, blood pressure and retinal microcirculation in adolescents. Nutr Metab Cardiovasc Dis 2014;24:1221–7. doi:10.1016/j.numecd.2014.05.014.

[6] Jafari T, Faghihimani E, Feizi A, Iraj B, Javanmard SH, Esmaillzadeh A, et al. Effects of vitamin D-fortified low fat yogurt on glycemic status, anthropometric indexes, inflammation, and bone turnover in diabetic postmenopausal women: A randomised controlled clinical trial. Clinical Nutrition 2016;35:67–76. doi:10.1016/j.clnu.2015.02.014.

[7] Markey O, Vasilopoulou D, Givens DI, Lovegrove JA. Dairy and cardiovascular health: Friend or foe? Nutrition Bulletin 2014;39:161–71. doi:10.1111/nbu.12086.

[8] Moslehi N, Shab-Bidar S, Mirmiran P, Sadeghi M, Azizi F. Associations between dairy products consumption and risk of type 2 diabetes: Tehran lipid and glucose study. Int J Food Sci Nutr 2015;66:692–9. doi:10.3109/09637486.2015.1034249.

[9] Bosnea LA, Kopsahelis N, Kokkali V, Terpou A, Kanellaki M. Production of a novel probiotic yogurt by incorporation of L. casei enriched fresh apple pieces, dried raisins and wheat grains. Food and Bioproducts Processing 2017;102:62–71. doi:10.1016/j.fbp.2016.11.010.

[10] Bimbo F, Bonanno A, Nocella G, Viscecchia R, Nardone G, De Devitiis B, et al. Consumers' acceptance and preferences for nutrition-modified and functional dairy products: A systematic review. Appetite 2017;113:141–54. doi:10.1016/j.appet.2017.02.031.

[11] Valls DJ, Pasamontes N, Pantaleón A, Vinaixa S, Vaqué M, Soler A, et al. Prospects of Functional Foods/Nutraceuticals and Markets. In: Ramawat KG, Mérillon J-M, editors. Natural Products, Springer Berlin Heidelberg; 2013, p. 2491–525. doi:10.1007/978-3-642-22144-6_67.

[12] Cairns G, Macdonald L. Stakeholder insights on the planning and development of an independent benchmark standard for responsible food marketing. Evaluation and Program Planning 2016;56:109–20. doi:10.1016/j.evalprogplan.2016.03.009.

[13] Cohen DA, Babey SH. Candy at the Cash Register — A Risk Factor for Obesity and Chronic Disease. New England Journal of Medicine 2012;367:1381–3. doi:10.1056/NEJMp1209443.

[14] Glanz K, Bader MDM, Iyer S. Retail grocery store marketing strategies and obesity: an integrative review. Am J Prev Med 2012;42:503–12. doi:10.1016/j.amepre.2012.01.013.

[15] Glanz K, Yaroch AL. Strategies for increasing fruit and vegetable intake in grocery stores and communities: policy, pricing, and environmental change. Prev Med 2004;39 Suppl 2:S75-80. doi:10.1016/j.ypmed.2004.01.004.

[16] Derbyshire J, Giovannetti E. Understanding the failure to understand New Product Development failures: Mitigating the uncertainty associated with innovating new products by combining scenario planning and forecasting. Technological Forecasting and Social Change n.d. doi:10.1016/j.techfore.2017.02.007.

[17] Markovitch DG, Steckel JH, Michaut A, Philip D, Tracy WM. Behavioral Reasons for New Product Failure: Does Overconfidence Induce Overforecasts? J Prod Innov Manag 2015;32:825–41. doi:10.1111/jpim.12252.

[18] Borgianni Y, Cascini G, Pucillo F, Rotini F. Supporting product design by anticipating the success chances of new value profiles. Computers in Industry 2013;64:421–35. doi:10.1016/j.compind.2013.02.004.

[19] Witte RS, Witte JS. Statistics. 9 edition. Hoboken, NJ: Wiley; 2009.

[20] Zheng W, Chen S, Song J, Liu J, Fan C. The influence of body mass index on outcome of open arthrolysis for post-traumatic elbow stiffness. Journal of Shoulder and Elbow Surgery 2017;26:809–14. doi:10.1016/j.jse.2016.12.065.

[21] Guilcher SJT, Kaufman-Shriqui V, Hwang J, O'Campo P, Matheson FI, Glazier RH, et al. The association between social cohesion in the neighborhood and body mass index (BMI): An examination of gendered differences among urban-dwelling Canadians. Preventive Medicine 2017;99:293–8. doi:10.1016/j.ypmed.2017.02.022.

[22] Mosallanezhad Z, Sotoudeh GR, Jutengren G, Salavati M, Harms-Ringdahl K, Wikmar LN, et al. A structural equation model of the relation between socioeconomic status, physical activity level, independence and health status in older Iranian people. Archives of Gerontology and Geriatrics 2017;70:123–9. doi:10.1016/j.archger.2017.01.004.

[23] Dragano N, Bobak M, Wege N, Peasey A, Verde PE, Kubinova R, et al. Neighbourhood socioeconomic status and cardiovascular risk factors: a multilevel analysis of nine cities in the Czech Republic and Germany. BMC Public Health 2007;7:255. doi:10.1186/1471-2458-7-255.

[24] Watt HC, Carson C, Lawlor DA, Patel R, Ebrahim S. Influence of Life Course Socioeconomic Position on Older Women's Health Behaviors: Findings From the British Women's Heart and Health Study. Am J Public Health 2009;99:320–7. doi:10.2105/AJPH.2007.129288.

[25] Umberson D, Montez JK. Social Relationships and Health: A Flashpoint for Health Policy. J Health Soc Behav 2010;51:S54–66. doi:10.1177/0022146510383501.

[26] Brown DW, Balluz LS, Heath GW, Moriarty DG, Ford ES, Giles WH, et al. Associations between recommended levels of physical activity and health-related quality of life. Findings from the 2001 Behavioral Risk Factor Surveillance System (BRFSS) survey. Prev Med 2003;37:520–8.

[27] Adjoian TK, Firestone MJ, Eisenhower D, Yi SS. Validation of self-rated overall diet quality by Healthy Eating Index-2010 score among New York City adults, 2013. Preventive Medicine Reports 2016;3:127–31. doi:10.1016/j.pmedr.2016.01.001.

[28] Fett A-K, Lattimore P, Roefs A, Geschwind N, Jansen A. Food cue exposure and body image satisfaction: The moderating role of BMI and dietary restraint. Body Image 2009;6:14–8. doi:10.1016/j.bodyim.2008.08.005.

[29] Edman JL, Yates A, Aruguete MS, DeBord KA. Negative emotion and disordered eating among obese college students. Eating Behaviors 2005;6:308–17. doi:10.1016/j.eatbeh.2005.05.004.

[30] Melnyk SE, Cash TF, Janda LH. Body image ups and downs: prediction of intra-individual level and variability of women's daily body image experiences. Body Image 2004;1:225–35. doi:10.1016/j.bodyim.2004.03.003.

[31] Vocks S, Legenbauer T, Heil A. Food intake affects state body image: impact of restrained eating patterns and concerns about eating, weight and shape. Appetite 2007;49:467–75. doi:10.1016/j.appet.2007.03.006.

[32] Lattimore P. Body dissatisfaction in females varies according to deprivation state and is modified by weight rather than restraint status. Appetite 2005;45:356–9. doi:10.1016/j.appet.2005.06.003.

[33] Lunde C, Gattario KH. Performance or appearance? Young female sport participants' body negotiations. Body Image 2017;21:81–9. doi:10.1016/j.bodyim.2017.03.001.

[34] Cordes M, Vocks S, Düsing R, Waldorf M. Effects of the exposure to self- and other-referential bodies on state body image and negative affect in resistance-trained men. Body Image 2017;21:57–65. doi:10.1016/j.bodyim.2017.02.007.

[35] Helgadóttir B, Owen N, Dunstan DW, Ekblom Ö, Hallgren M, Forsell Y. Changes in physical activity and sedentary behavior associated with an exercise intervention in depressed adults. Psychology of Sport and Exercise 2017;30:10–8. doi:10.1016/j.psychsport.2017.01.006.

612 [36] Ford ES, Schulze MB, Kröger J, Pischon T, Bergmann MM, Boeing H. Television watching and
613 incident diabetes: Findings from the European Prospective Investigation into Cancer and Nutrition-
614 Potsdam Study. J Diabetes 2010;2:23–7. doi:10.1111/j.1753-0407.2009.00047.x.

615 [37] Thorp AA, Owen N, Neuhaus M, Dunstan DW. Sedentary behaviors and subsequent health outcomes in
616 adults a systematic review of longitudinal studies, 1996-2011. Am J Prev Med 2011;41:207–15.
617 doi:10.1016/j.amepre.2011.05.004.

618 [38] Matthews CE, George SM, Moore SC, Bowles HR, Blair A, Park Y, et al. Amount of time spent in
619 sedentary behaviors and cause-specific mortality in US adults. Am J Clin Nutr 2012;95:437–45.
620 doi:10.3945/ajcn.111.019620.

621 [39] Teychenne M, Ball K, Salmon J. Sedentary behavior and depression among adults: a review. Int J Behav
622 Med 2010;17:246–54. doi:10.1007/s12529-010-9075-z.

623 [40] Lucas M, Mekary R, Pan A, Mirzaei F, O'Reilly EJ, Willett WC, et al. Relation between clinical
624 depression risk and physical activity and time spent watching television in older women: a 10-year
625 prospective follow-up study. Am J Epidemiol 2011;174:1017–27. doi:10.1093/aje/kwr218.

626 [41] Hamam FA, Eldalo AS, Alnofeie AA, Alghamdi WY, Almutairi SS, Badyan FS. The association of
627 eating habits and lifestyle with overweight and obesity among health sciences students in
628 Taif University, KSA. Journal of Taibah University Medical Sciences n.d.
629 doi:10.1016/j.jtumed.2016.12.001.

630 [42] Ebbeling CB, Pawlak DB, Ludwig DS. Childhood obesity: public-health crisis, common sense cure. The
631 Lancet 2002;360:473–82. doi:10.1016/S0140-6736(02)09678-2.

632 [43] Lee J. Mitochondrial drug targets in neurodegenerative diseases. Bioorganic & Medicinal Chemistry
633 Letters 2016;26:714–20. doi:10.1016/j.bmcl.2015.11.032.

634 [44] Cohen M. "Detox": science or sales pitch? Aust Fam Physician 2007;36:1009–10.

635 [45] Lordo RA, Dinh KT, Schwemberger JG. Semivolatile organic compounds in adipose tissue: estimated
636 averages for the US population and selected subpopulations. Am J Public Health 1996;86:1253–9.

637 [46] Sanborn M, Cole D, Kerr K, Vakil C, Sanin LH, Bassil K. Systematic Review of Pesticide Human
638 Health Effects. Ontario, Canada: Ontario College of Family Physicians; 2004.

639